i) $t_b = -T_b$ with $T_b = C_b / (2 P_{2b} – 1)$ if $P_{0b} \leq 1/2 < P_{2b}$

(27)

ii) $t_p = -C_p / (2 B – 1)$, $T_p = -t_p$ if $A \leq 1/2 < B$

These solutions derive from the hypothesis made that when the two agents make an effort, they expect a benefit large enough to cover the cost incurred to achieve the goal. If on the other hand they make no effort they will be punished by the politician. The punishment is the politician's reward to the agents when they reach a bad performance. In this case, therefore, the agents obtain a negative expected benefit.

Keeping in mind that the politician's expected utility function in the non-electoral period is:

(28) $E(U – u) = H' – u(T_b) P_{2b} - u(t_b) (1 - P_{2b}) - u(T_p) B - u(t_p) (1 - B)$

If we substitute the incentive payments in the politician's utility function E(U – u), as we did in the previous case, we obtain

(29) $\mathbf{E(U – u) = H' - (1/2) \{[C_b^2 / (2 P_{2b} - 1)] + [C_p^2 / (2 B -1)]\}}$

5. Contract with a single agent in the electoral period.

Let us now consider the case where both the functions are delegated to a single authority, the central bank. To see whether this situation is advantageous for the politician, we have to calculate the expected utility and compare it with the expected utility with two separate authorities.

We suppose that the politician will offer four different incentive payments to the CB, according to whether four different events take place. In particular, the politician will give to the agent

T_{10}	if	$E_1 = Bs \cap -Ps$
T_{11}	"	$E_2 = Bs \cap Ps$
T_{01}	"	$E_3 = -Bs \cap Ps$
T_{00}	"	$E_4 = -Bs \cap -Ps$

However, these solutions, which are not very interesting from an economic point of view, will be disregarded; only i) will be considered. This does not change the results.

with (presumably) $T_{10} \geq T_{11} \geq T_{00} \geq T_{01}$.

We should remember that in the electoral period the politician prefers price instability because an inflationist policy, for the reasons seen in the previous sections, increases his probability of re-election.

The politician's expected net utility in the electoral period is therefore:

$$(1)' \qquad E(U\text{-}u \mid e_{10}) = [G - u(T_{11})] \Pr(E_2 \mid e_{10}) + [G (1 + R) - u(T_{10})] \Pr(E_1 \mid e_{10}) +$$

$$+ [g - u(T_{01})] \Pr(E_3 \mid e_{10}) + [g (1 + r) - u(T_{00})] \Pr(E_4 \mid e_{10}) =$$

$$= [G - u(T_{11})] P_{1b} P_{3p} + [G (1 + R) - u(T_{10})] P_{1b} (1 - P_{3p}) +$$

$$+ [g - u(T_{01})] (1 - P_{1b}) P_{0p} + [g (1 + r) - u(T_{00})] (1 - P_{1b}) (1 - P_{0p}) = H - H_0'$$

with

$H_0' = u(T_{11}) P_{1b} P_{3p} + u(T_{10}) P_{1b} (1 - P_{3p}) + u(T_{01}) (1 - P_{1b}) P_{0p} + u(T_{00}) (1 - P_{1b}) (1 - P_{0p})$.

The incentive expected by CB will be:

$$(30)\ E(I_p \mid e_{bp}) = T_{10} \Pr(E_1 \mid e_{bp}) + T_{11} \Pr(E_2 \mid e_{bp}) + T_{01} \Pr(E_3 \mid e_{bp}) + T_{00} \Pr(E_4 \mid e_{bp}) - C_{bp}(e_{bp})$$

where C_{bp} is the cost of the authority when he makes efforts e_{bp}.

The central banker expects to gain more if he makes an effort to achieve banking stability, if we have the same conditions for the monetary stability. Moreover he expects better payment if he makes no effort to achieve price stability. This is justified by the awareness that in the electoral period, the politician prefers a degree of instability in order to reach his goal, i.e. re-election.

The incentive and participation constraints, therefore, become :

$$(31) \quad \begin{aligned} g_1 &= E(I_p \mid e_{10}) - E(I_p \mid e_{00}) \geq 0 \\ g_2 &= E(I_p \mid e_{10}) - E(I_p \mid e_{11}) \geq 0 \\ g_3 &= E(I_p \mid e_{10}) - E(I_p \mid e_{01}) \geq 0 \\ g_4 &= E(I_p \mid e_{10}) \geq 0 \end{aligned}$$

or

$$(31)' \quad \begin{cases} g_1 = g_4 - E(I_p \mid e_{00}) \geq 0 \\ g_2 = g_4 - E(I_p \mid e_{11}) \geq 0 \\ g_3 = g_4 - E(I_p \mid e_{01}) \geq 0 \\ g_4 = E(I_p \mid e_{10}) \geq 0 \end{cases}$$

As for the costs C_{bp} of effort, we define[23]:

$$(32)\ C_{bp}(e_{bp}) = \begin{cases} 0 & \text{if } e_{00} \\ C_{bp} & \text{if } e_{11} \\ C_{bp} - C_p & \text{if } e_{10} \\ C_{bp} - C_b & \text{if } e_{01}. \end{cases}$$

Also here C_{bp} is constant, as C_b and C_p.

6. Comparison of the two contracts in the electoral period.

We have seen that in the election period, if the politician appoints two agents, his expected utility is:

$E(U\text{-}u \mid e_{10}) = H - H_0$.

On the other hand, the utility expected by the politician, when he entrusts the task to a single agent is

(1)' $E(U\text{-}u \mid e_{10}) = H - H_0'$

To prove that in the electoral period it is to the politician's advantage to give the two tasks to a single agent - for an appropriate allocation of the size of incentive payments T_{ij}, compatible with the constraints (C1)(see appendix C.) $g_k \geq 0$ for k = 1,2,3,4 - one needs to show that it is possible to have

$H_0' \leq H_0$.

[23] For the problem of constrained optimization see appendix C.).